

**Table 4.1.2 Estimated Time to Rehabilitate the
Diversion Dam and Canal Headgates**

Task	Duration
1) Update BOR Design Study to include SCADA, alternative crest control and fish screens.	4 months
2) Final Design	8 months
3) Construction Phase	18-24 months
TOTAL TIME	30-36 months

4.2 CANAL HEADGATE STRUCTURE

4.2.1 Structure Overview

The St. Mary Diversion headgate structure was completed at the same time as the diversion dam in 1915. The headgate structure is contiguous with the dam on the west abutment (Figure 4.2.1).



Figure 4.2.1 Looking at downstream end (canal side) of headgate structure. Diversion dam is located behind headgates (10/13/04).

The structure contains eight steel slide gates. Each gate is 5 ft. x 5.5 ft in size. Hoists located on top of the structure are used to open and close the gates. The main gate wall is about 59 feet long and 19 feet high. A wing wall extends upstream about 65 feet above the headgates (Figure 4.2.2). A concrete channel extends from the dam along the front of the gates and transitions to the original channel about 30 feet upstream of the last gate. Original plans indicate this channel was 20 feet wide, but the visible portions of the channel wall on the east side suggest the channel is closer to 57 feet wide. The gates were originally equipped with mechanical operators. These have been replaced with hydraulic operators on Gates 2 through 7. Gate 1 remains a mechanical operator. Gate numbering starts with 1 on the north end of the structure.



Figure 4.2.2 Upstream view of headgates showing trash boom, electric fish barrier, and dam sluiceways (11/11/04).

Debris is a problem for gate operation and for the electric fish barrier. A floating boom was installed upstream of the electric fish barrier and gates to divert debris; however, debris still impacts gate operations (Figure 4.2.3).

4.2.2 Existing Conditions and Deficiencies

Headgate Structure.

Some concrete repairs were made to the upstream side of the structure in 2003 when the experimental electric fish barrier was installed. Water flowing in the channel prevented a close inspection of the upstream side of the gates. The BOR 2003 review report indicated concrete on this side was in satisfactory condition at this time. That report indicated that several of the gate stems were bent and in need of replacement and one gate was missing a stem. The Gate 5 operator was in the process of being repaired during our inspection.



Figure 4.2.3 Upstream view of gate openings (11/11/04).

The bottom member of gates 1, 4, 6, & 7 were reported to be bent and cracked in the 2003 report. Debris is currently preventing total closure of gates 3 and 5 and these gates are leaking badly (Figures 4.2.3 and 4.2.4). The remaining gates had some leakage, but not as bad.



Figure 4.2.4 Downstream view of headgate structure. Note heavy leakage through Gates 3 and 5 (10/13/04).

Concrete on the top walkway has spalled and reinforcing steel is exposed in some locations. The concrete on the downstream side of the gates is in poor condition. Concrete is spalled around the gate frames and on the piers, and rebar is exposed in many places. The floor of the structure downstream of the gates is pitted and eroded to varying degrees up to depths of about 3 inches. Reinforcing steel is exposed in places along the floor.



Figure 4.2.5 Close-up (downstream) of heavy leakage and debris on Gate 3 (10/13/04).

The cemented rip rap downstream of the structure appears generally adequate. Some failure is starting to occur on the south side at the junction with the concrete wall and will get worse.

Sluice Channel.

The concrete channel wall on the east side of the sluiceway (in front of the headgates) is in extremely poor condition where it is exposed (Figure 4.2.6). Most of the wall is hidden beneath sediment. The channel bottom was not observable.



Figure 4.2.6 Sluiceway training wall upstream of canal headgates (11/11/04).

Floating Boom

A floating boom has been installed to divert debris away from the headgates and the electric fish barrier. The boom appears to have diverted some debris, but has not been entirely effective.

Fish Barrier

Loss of fish into the canal system is another related issue that must be controlled to protect the bull trout population. An electric fish barrier was attached to the concrete walls at the entrance to each gate in the Spring of 2003. A report on its effectiveness was not available at this time. It is our understanding that evaluation of this system will continue during the 2005 season. The barrier appears to be in good condition.

Operation and Safety

The gates at a minimum need repair so that they can completely shut off the flow of water during the off-season. Flow of water in the canal during the winter aggravates concrete deterioration problems caused by freezing at the headgates and at the Kennedy siphon and check structure. Debris will continue to be a major operational problem once the gates are repaired unless some type of debris barrier is installed. Currently there is no way to safely remove the debris. The floating boom deflects some debris but also becomes entangled with trees and larger debris. There is no way to clear the boom without entering the stream.

There are safety issues related to the electric fish barrier. There are warning signs, but there are no physical barriers that prevent someone from contacting the barriers if they were in the stream.

As with the diversion dam, the headgates do not have instrumentation, automation, or remote-control capabilities to enhance operation and improve safety.

4.2.3 Rehabilitation Alternatives

See Section 4.1.3 for a combined discussion of repair and replacement alternatives for both the diversion dam and the canal headgates.

4.2.4 Estimated Rehabilitation Costs

See Section 4.1.4 for a combined discussion of estimated rehabilitation costs for both the diversion dam and the canal headgates.

4.2.5 Rehabilitation Schedule

See Section 4.1.5 for a combined discussion of the anticipated rehabilitation schedule for both the diversion dam and the canal headgates.